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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/743,438	12/23/2003	Yoshihiro Takao	032180	8136

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WESTERMAN, HATTORI, DANIELS & ADRIAN, LLP
1250 CONNECTICUT AVENUE, NW
SUITE 700
WASHINGTON, DC 20036

EXAMINER

QUACH, TUAN N

ART UNIT

PAPER NUMBER

2826

DATE MAILED: 09/15/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/743,438

Applicant(s)

TAKAO, YOSHIHIRO

Examiner

Tuan Quach

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 19 August 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-3 and 5-16 is/are pending in the application.
- 4a) Of the above claim(s) 9-16 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-3 and 5-8 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 08/14/05
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after allowance or after an Office action under *Ex Parte Quayle*, 25 USPQ 74, 453 O.G. 213 (Comm'r Pat. 1935). Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, prosecution in this application has been reopened pursuant to 37 CFR 1.114. Applicant's submission regarding the Information Disclosure Statement filed on August 19, 2005 has been entered and considered.

The previous allowability of claims 1-3 and 5-8 is withdrawn in view of applicant's newly submission of the IDS and prior art therein on August 19, 2005. New rejections follow.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-3 and 5-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Maeno et al. in view of any of Wu, Watanabe et al. or the admitted prior art (APA).

Maeno et al. 6,753,611 teaches the problem of proximity effect which results in rounding end parts of the main wires or interconnections (column 1 lines 22-60) and teaches the solution of providing extensions at the ends parts thereof either in line with the main wires/interconnections or orthogonal, i.e., perpendicular) thereto, a width of the

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extended portions being also equal to or narrower, i.e., being below, than the width of the main wires or interconnections. The provision of the via plugs or contacts between the metal wires is also shown, including the use of such via plugs in an intermediate layer (presumably dielectric or all plugs would be shorted together). See, e.g., Fig. 12, metal wires 3, 5, 6, extended portions 16, 17, etc., column 2 line 23 to column 11 line 32, particularly column 9 line 58 to column 11 line 22. The extended portions in both directions perpendicular to the extending direction of the main wire or interconnection are also taught, e.g., 17. Maeno et al. lacks primarily regarding claims 1-3 the explicit showing of the insulating layer surrounding the main wire or interconnection, e.g., such as in a damascene process, and the explicit showing of a semiconductor substrate.

It would have been obvious to one skilled in the art in practicing the above invention to have recited or employed the insulating layer surrounding the interconnection or main wires that are not explicitly shown in Maeno et al. since such correspond to conventional processing and structure for forming the interconnection or main wire in questions as admitted in the instant specification, page 1, the last six lines, page 2 the first 10 lines. Such would have been further conventional and obvious as evidenced by Wu, 6,017,815 of record, where the first insulating layer 34/36 serves to isolate the adjacent main wires 32 as shown in Fig. 3C-3F, column 2 lines 14-64; or by Watanabe et al., 6,787,907 B2 Fig. 1E, column 9 lines 31-50, Fig. 8H, wherein the wiring 20 being buried in insulating layer 15 is also shown.

Conversely, it would have been obvious to one skilled in the art in practicing the prior art processes above to have employed extended portions at the ends of the main

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wires or interconnections either perpendicular (orthogonal) thereto or in line therewith, including the width of such extended portions being equal to or narrower than that of the wire or interconnection, as suggested by Maeno et al. above to prevent disconnections at the end parts of the interconnections caused by the promiximity effect as taught by Maeno et al. The wires being on a semiconductor substrate would have been obvious and/or inherent in the above prior art which deals with semiconductor integrated circuits and as shown in, e.g., substrate 111 or Watanabe et al. Alternatively, official notice is given regarding such conventional underlying semiconductor substrate.

Regarding claim 5, the selection of a minimum width of the contact hole being larger than a minimum width of the interconnection would have been obvious and would have been within the purview of one skilled in the art where contact area can be maximized and as shown in Fig. 2 of Wu.

Regarding claim 6, the provision of the extended portion of the second interconnection on a first interconnection and intersecting thereto would have been obvious for the reasons delineated above regarding claims 1-3 where the first and second interconnections corresponding to adjacent levels, e.g., N and N+1 as taught in Maeno et al. for multilevel interconnections. Regarding claims 7 and 8, the electrical connections between the levels where desired and the insulation therebetween would have been conventional and obvious depending on circuit or connection requirement and as evidenced by Maeno et al. to provide the desired or necessary connection or separation in a multilevel interconnection.

Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Maeno et al. in view of any of Wu, Watanabe et al., or APA as applied to claims 1-3 and 5-8 above, and further in view of Bease et al. of record.

Re claim 8, additionally, the second interconnection not connected to the first interconnection would have been obvious and apparent where other interconnection layer parallel to or separated therefrom, e.g., an adjacent but unconnected interconnect on the same level where connection is not required or desired, e.g., as in Fig. 8, structure 8 in Bease if unconnected to structure 9, or two adjacent and unconnected interconnections in the same level, e.g., as in instant Fig. 1C.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to examiner Tuan Quach whose telephone number is 571-272-1717. The examiner can normally be reached on M-F from 8:30 AM to 4:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor Nathan Flynn, can be reached on 571-272-1915. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Tuan Quach
Primary Examiner